KNOWLEDGE

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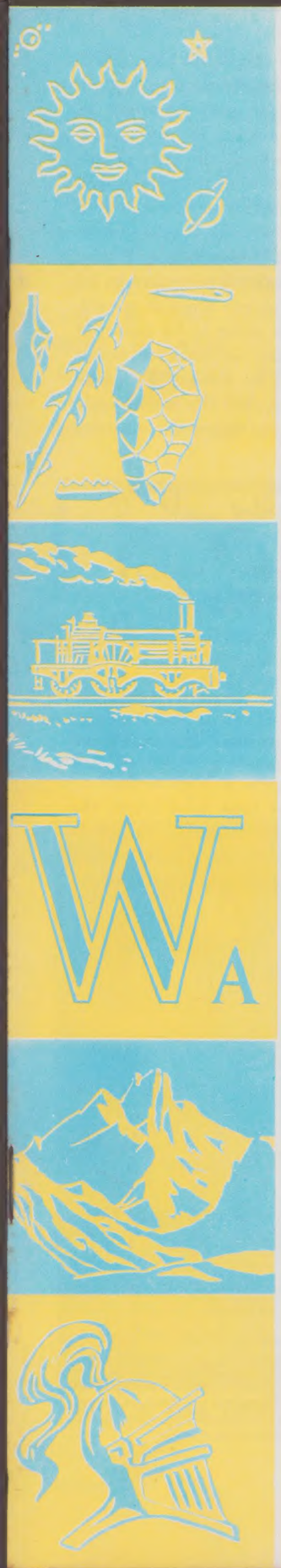

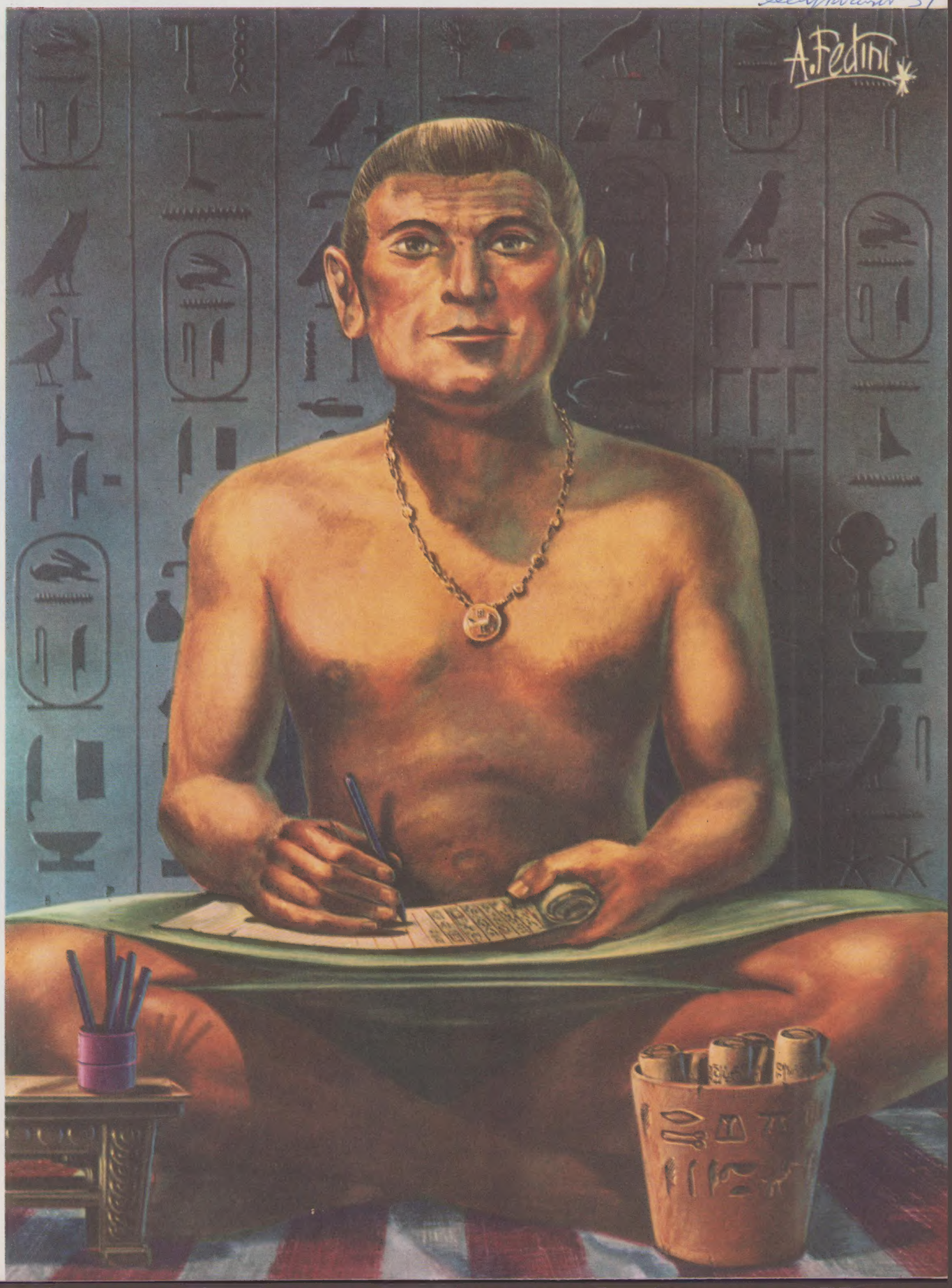

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WRITING

YOU can tell almost as much about people by looking at their handwriting as their faces. You can tell what part of the world they come from; how advanced the civilisation to which they belong is; how well educated they are; and even something about their character. Indeed, a graphologist (handwriting expert) can claim: 'Show me your handwriting and I will tell you what you are.'

Do not think that the writing system you use is the only one in the world. You probably write with the Roman alphabet. This is what you were taught in school and it is what *Knowledge* is printed in. It is also the most used writing system in the world – in fact almost twice as many people write with it, or read it, as with any other writing system. It has spread all over America, Europe, much of Africa, and the East. The next most used writing system after this is Chinese, which is followed by Arabic and Marathi. Arabic is used all over the Middle East and in North Africa, and Marathi in north-west and central India. After these come the Cyrillic alphabet (used in the Soviet Union) and the Bengal and Japanese writing systems. There are also several small but distinct writing systems with a long history – in the western world the best known are Greek and Hebrew. Not all these handwritings are like ours and read from left to right; Chinese, for instance, can be read from top to bottom, and Arabic from right to left.

Most of the world's handwritings are very different from what they were many thousands of years ago. Not only have the actual symbols used changed; the method of writing these symbols has done so too.

So first we will look at how our alphabet has evolved from the first scrawls of primitive man; secondly, we will see how the way of writing our alphabet has changed; thirdly, we will look at writing materials throughout the ages; finally, we will examine the different types of handwriting and see what light they throw on occupation and character.

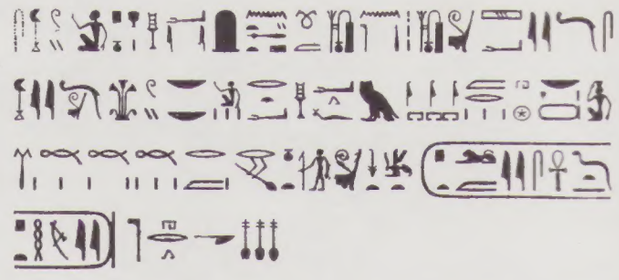
How our alphabet has evolved

The word alphabet is derived from the first two letters in the Greek alphabet, which are *alpha* and *beta*, and is thus used correctly when it refers to a system of writing based on the Greek alphabet.

① *A deer drawn on a stone found in Spain*

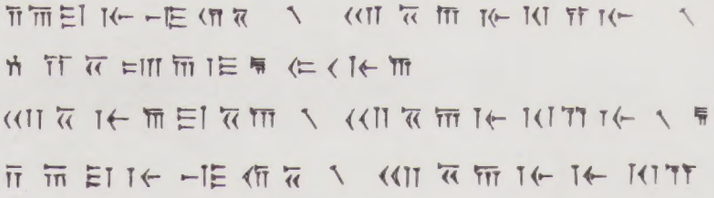
Our alphabet is called a phonetic one. This is the most advanced form of alphabet and it uses symbols to express sounds. 'D', for instance, makes a 'duh' sound and so on. However, the first writing systems did not express a sound at all. There were several stages and thousands of years of development before this could be reached.

The first symbols used were called *mnemonic*. In this system a notch in some wood or a knot in a bit of material might be used to aid memory. This is like tying a knot in your handkerchief to remind you of something. However, the only people who were going to understand this alphabet were the person who made the notch, or tied the knot, and the people to whom he told what these signs meant. So out of this developed the use of pictures to record or to communicate. If, for instance, a man killed an animal when out hunting and wanted to record it, he would draw it (*see fig.* 1). But then the problem arose of recording or communicating ideas. Thus symbols came to be used not only to record material facts, but also ideas; for instance, water pouring out of a jug might mean coolness. In Ancient Egyptian writing, called Hieroglyphics (*see fig.* 2), we find the use of some symbols to represent ideas and others to represent material



② *Ancient Egyptian Hieroglyphics; the Egyptians later introduced some phonetic symbols*

objects. As the writing system came to be used more often, the symbols ceased to look like what they were originally meant to represent. Persian Cuneiform (*see fig.* 3) is an example of a writing system that has done away with all pictures, although the symbols still represent things and ideas.



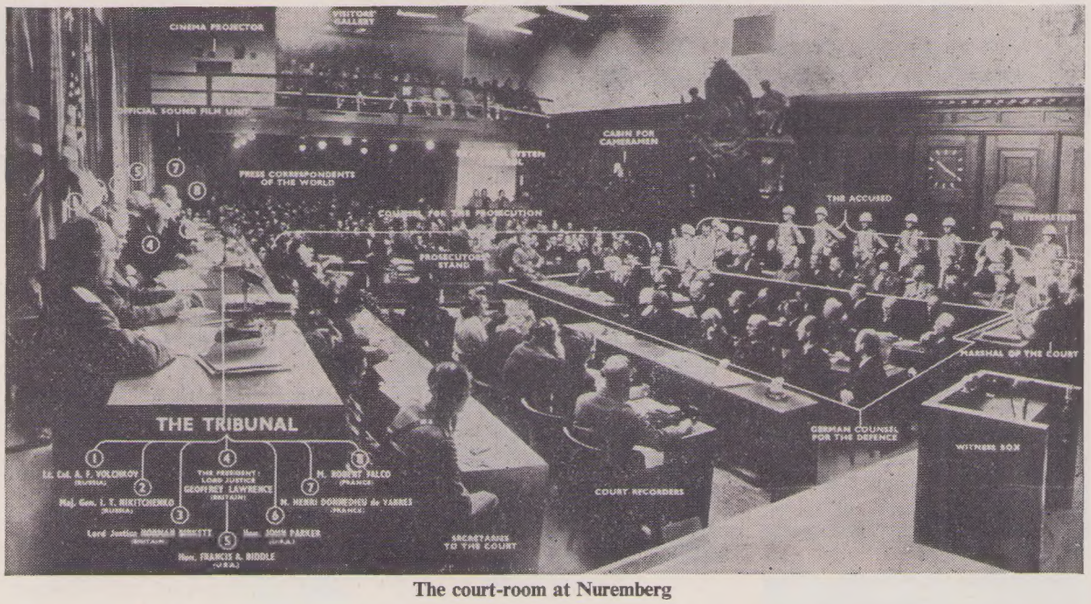
③ *Ancient Persian Cuneiform; the name was given to it on account of its wedge-shaped characters*

The fourth stage in the development of writing systems was the most important; that is when the symbols ceased to represent ideas and material things and began to represent sounds. In fact they became *phonetic* and people could write what they could speak. A phonetic writing system was brought to Europe by the Phoenicians (*see fig.* 4). They gave it to the

Previous page: An Ancient Egyptian scribe (from a wooden statue of 2500 B C in the Louvre Museum, Paris). Egyptians were among the first people to develop a system of writing.

KNOWLEDGE NEWS
Week beginning 15th September 1963

This was a trial without parallel. Men who had been responsible for the deaths of millions and inflicting incalculable suffering had to answer for their crimes. But what court could try them? What sentences could be great enough? Were all of the 22 men on trial guilty? The answers to these questions were provided in the court-room at Nuremberg, scene of the greatest ever criminal trial.



The court-room at Nuremberg

A GOVERNMENT ON TRIAL

THE most terrible war of all was over. 22 million people had been killed. The cost both in money and human suffering was incalculable. Then as the concentration camps and extermination camps in Germany and Poland were thrown open a new horror emerged. It was obvious that the vast majority of Germans had no responsibility for Belsen, Buchenwald, Auschwitz and other dreadful camps like them, yet it was estimated that over 5 million Jews had been killed for no reason other than that of their race.

Who was guilty? What punishment was enough for those who had perpetrated these hideous crimes, which had resulted in so much untold and indescribable anguish and misery? The answer to the first question was given by the powers who had defeated Germany in battle. It was the Nazis. The answer to the second question was to be provided by a trial – a trial of those high-ranking men who had guided Germany's destinies for 12 years. The place chosen was Nuremberg.

It was, in fact, to be a government on trial. But by what law could a government be tried? Clearly not by state law, the law which governs us in our everyday lives. The answer was International Law and the laws of humanity. War had been outlawed by the League of Nations, and therefore the Nazis were accused of 'waging an aggressive war', as well as of the murder of millions.

The men accused of causing the deaths of millions (Doenitz is absent). Back row *(left to right)*: Raeder *(just visible)*; Schirach; Sauckel *(partially concealed)*; Jodl; Papen; Seyss-Inquart; Speer; Neurath; Fritzsche. Front row *(left to right)*: Goering; Hess; Ribbentrop; Keitel; Kaltenbrunner; Rosenberg; Frank; Frick; Streicher; Funk; Schacht.

The trial begins

The trial began in November 1945 and went on until October 1946. Proceedings were conducted in four languages. The top legal brains of Great Britain, the United States, France, and the Soviet Union were there.

Who were the men on trial? First, there were the top Nazi party members like the former Deputy Fuehrer Hess, who fled to Britain in 1941; Goering, the Reich Marshal; Ribbentrop, the Foreign Minister; and Rosenberg, the racialist writer whose books

continued on page 2

Front row (*left to right*): Goering (committed suicide); Hess (imprisoned); Ribbentrop (hanged); Keitel (hanged); Kaltenbrunner (hanged). Back row (*left to right*): Doenitz (imprisoned); Raeder (imprisoned); Schirach (imprisoned); Sauckel (hanged).

Either out of uniform or stripped of all badges of rank, the former leaders of Germany listen impassively to the catalogue of Nazi atrocities that had been committed in their country's name.

Front row (*left to right*): Rosenberg (hanged); Frank (hanged); Frick (hanged). Back row (*left to right*): Jodl (hanged); Papen (acquitted); Seyss-Inquart (hanged).

NUREMBERG

(continued)

were the basis of the Nazi creed. There were also high-ranking military men like Admiral Doenitz, who actually succeeded Hitler for a few days as Fuehrer of Germany; Admiral Raeder; Field Marshals Keitel and Jodl; and SS man Kaltenbrunner. There were administrators too; men like Speer,

Hermann Goering

Rudolf Hess – still in Spandau

who played a major role in organising Germany's industry.

The politicians were accused of waging an 'aggressive war'. The military leaders were accused of waging that war 'inhumanly' – both at sea in the devastating U-boat campaign, and on land in their appalling treatment of the civilian populations of occupied countries.

There could be no real defence for many of the accused. The testimonies against them were too overwhelming; despite this there was not one plea of guilty.

The men that got away

Some escaped their trial. Hitler, and Goebbels, the Propaganda Minister, had committed suicide. Himmler, the Chief of the SS, was killed trying to flee. Bormann, an important civil servant and Hitler's friend, was never traced, and may to this day be alive. Eichmann, another civil servant, also vanished – though he recently payed his penalty at the hands of Israeli judges. Goering, who was sentenced to death, managed at the last moment to cheat the hangman, somehow obtaining poison with which to commit suicide.

Of the 22 men on trial only three were acquitted: these were Papen, Schacht, and Fritzsche. 12 were sentenced to be hanged: Goering, Ribbentrop, Keitel, Jodl, Rosenberg, Frick, Seyss-Inquart, Sauckel, Bormann, Kaltenbrunner, Frank, and Streicher. All except Goering and Bormann were executed. The rest – Doenitz, Neurath, Speer, Schirach, Raeder, Funk, and Hess – got terms ranging from 10 years to life. They were locked in the massive Spandau fortress at Berlin, guarded day and night by teams of soldiers from Great Britain, the Soviet Union, France, and the United States. Some have died or finished their sentences or been released on health grounds. Schirach, Hess, and Speer are still there.

Doenitz when in Spandau prison

Letter from the Editor-in-Chief

37 HERTFORD STREET, LONDON, W.1.

TODAY Sweden is not one of the most important countries in the world. True she is often in the news; we hear a lot about her high standard of living and industrial success. But today a 'summit conference' of the world's most important countries would not include Sweden.

Yet just look back to the late seventeenth century; then Sweden was one of the most important countries in Europe, and if there had been such things as summit conferences at that time, Sweden would definitely have been included. She had a large empire which stretched over much of the Baltic and Scandinavia. Her armies were strong enough to defeat any in Europe. Her court was a brilliant one.

But the simultaneous growth in the power of Russia and Prussia was too much for her, and in the eighteenth century Sweden declined. Of course, there were other countries which are today comparatively unimportant but which were once in a similar position of power: Austria under the Habsburgs; Spain with her vast empire in the New World. But unlike them, Sweden's brief period of glory has escaped general notice.

John Chancellor

ANNOUNCEMENT FOR READERS IN LONDON

Readers living in or visiting London may want to visit our special 'Knowledge' stand which has just been opened at Waterlows, 107 Park Lane. Visitors are welcome between 9 a m and 5.30 p m. They will find a complete range of all back numbers, bound volumes and binders, and the Manager, Mr Turner, will be pleased to assist with advice and information. The nearest tube station is Marble Arch.

Gift subscriptions can be mailed to any part of the world.

FACTORS

A word game

The following statements are either 'true' or 'false'. When one is 'true' score the *first* number, but if you think that it is 'false' score the *second* number. Change the numbers into letters (1=A; 2=B; and so on). Put these letters into the squares to make a five-letter word reading down the frame.

Campanologists usually live in tents (23) – (5)

Horses rise from the ground fore-legs first (1) – (14)

The 'D' in Franklin D. Roosevelt, President of the USA (1933–1945), *stands for Duncan* (4) – (7)

It is possible to make four more words from LISTEN using all the six letters for each word (12) – (2)

Honolulu is in the Hawaiian Islands (5) – (26)

ANSWER

Eagle
(Campanologists make a study of bells, their sounding and their ringing; the 'D' stands for Delano; and if you said you can make four more words from LISTEN you were right. They are: ENLIST, SILENT, TINSEL, INLETS.)

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MESOPOTAMIA : ancient history

CIVILISATION seems to have been born in China. There, 4,000 years before the birth of Christ, a highly advanced civilisation already flourished. Gradually it spread westwards across the Asian continent. But not for over 3,000 years did it reach western Europe; in about the third millennium B C it had come to a full stop in the Middle East. Here its two most important centres were the great rivers the Nile and the Euphrates, and for thousands of years the Egyptian and Babylonian civilisations were the greatest in the world.

Mesopotamia – 'the land between the rivers' – is the ancient name given to the whole district enclosed by the Tigris and the Euphrates, the home of what has come to be called Babylonian civilisation. The area falls naturally into two parts: very low and flat in the south, rocky and mountainous towards the north. Two separate empires were to grow up in these areas: Assyria in the north, and Babylonia in the south. These two were constant rivals; first the Babylonian, then the Assyrian, and then once more the Babylonian empire dominated the great Mesopotamian plain.

Mesopotamia was one of the most favoured regions of the ancient world. According to tradition, it was the Garden of Eden, home of Adam and Eve. The extraordinary fertility of its rich alluvial soil, aided by vast irrigation projects, enabled the people of Mesopotamia to live a settled and prosperous existence. In this atmosphere of security and plenty the arts of writing, of law-making, and of building developed. Mesopotamia became the home of a civilisation unparalleled even in the cultured world of Asia Minor.

But its extraordinary richness caused Mesopotamia to be fought over not only by Assyrians and Babylonians, but also by outsiders – Hittites, Egyptians, and eventually by the Persians who finally absorbed it into their great empire in 539 B C.

Sumerians and Akkadians

The earliest Mesopotamian empires were founded by the Sumerians and Akkadians in the southern part of the Tigris-Euphrates plain. They were centred on such city-states as Ur, Lagash, and Akkadia, but gradually extended their rule to include all the district which was to become Babylonia. The Sumerians (see page 1998) evolved the wedge-shaped or *cuneiform* style of writing, worked out a system of figures, and built the first of the rounded, soaring temple towers or *ziggurats* which were to be a feature of Babylonian cities as long as they endured. The Akkadians were Semitic people who probably came out of the Arabian desert and settled just north of the Sumerians. Their great King Sargon (2350–2300 B C) conquered all Babylonia as far as the Persian Gulf to the south, the borders of Elam to the east, and the country west of the upper Euphrates right to the Mediterranean. Towards 2000 B C this empire was destroyed by a mountain people from the east, the Guti. A period of civil war and chaos followed until finally the whole of Mesopotamia became united under the Sumerian rulers of Ur. The Sumerian empire now entered its last and greatest phase. The whole empire was organised on a centralised basis directed from Ur. Fabulous temples were built, and it was now that the marvellous irrigation system of canals was constructed. But after a hundred years of prosperity Sumer was overthrown by the Elamites. They never settled the conquered land, which was soon overrun by two Semitic states, Isin and Larsa.

A bas-relief of the Assyrian King Sargon II found in a palace near Nineveh

Head of an early Sumerian king

The first Babylonian empire

In about 1800 B C King Hammurabi united the kingdoms of Isin and Larsa and, moving his capital to Babylon, became the first king of Babylonia. His 43-year reign was the golden age of early Babylonian civilisation. The city of Babylon (see page 1169), on the Euphrates, now became established as the capital of the empire; its city god, Marduk, was acknowledged as supreme above all other gods and goddesses of the empire, and it became a flourishing trading centre. Much of our knowledge of Hammurabi's reign comes from his code of laws, which has been found inscribed upon a huge black stone at Susa. These laws give us a picture of a very active community, in which trade was of enormous importance. Dishonesty in buying and selling was one of the many crimes punishable by death. Hammurabi is revealed as a just and capable, if severe, ruler; it is interesting that the punishments were much harder on the rich than on labourers, merchants, and workmen.

Assyrian empire

Hammurabi reigned for 43 years. Shortly after his death the first Babylonian empire was destroyed by waves of invaders who had greedily eyed the empire's wealth during the strong rule of Hammurabi. These invaders – Hittites and Hurrians from Syria, and Kassites from the Zagros mountains – were barbarians compared with the cultured Babylonians, and the balance of power in Mesopotamia shifted to the Assyrian empire in the north. The Assyrians gradually enlarged their empire at the expense of the great southern kingdom. Assurnasipal, the first great Assyrian king, determined to dominate Asia Minor and campaigned as far afield as the Mediterranean coast. He was an utterly ruthless warrior, and under him the Assyrians gained a lasting reputation for cruelty. The new empire rose to the height of its power under Tiglath-pileser III (who was the first Assyrian to be crowned king of Babylon) and his successors: Shalmaner, Sargon II, Sennacherib, and Assurbanipal. These rulers held all Asia Minor in thrall. They pitilessly destroyed the great city of Babylon and flooded it by diverting the Euphrates. Not only Babylon, but all the Syrian states submitted to them, and the Israelite kings paid tribute. From her capital, Nineveh, on the river Tigris, Assyria ruled to the Egyptian border, to the Annemian mountains, and to the Persian Gulf.

But the Assyrians were not just a race of warriors. Their kings used the wealth plundered from defeated countries to build magnificent palaces. Their triple arches were models for the triumphal arches of Rome; their large-scale sculpture foreshadowed Roman statuary. The last great Assyrian king, Assurbanipal (see page 2192) had a vast library of 22,000 clay tablets which he collected from innumerable religious, scientific, and literary works of past ages. His library was discovered at Nineveh and part of it is now in the British Museum.

The Assyrian King Assurbanipal

The second Babylonian empire

Assyrian domination lasted well over 500 years before it was overthrown. The Babylonians had gradually become stronger and were finally able to turn the tables and conquer their northern neighbour. In 612 B C King Nabopolassar of Babylon combined with the Medes to attack Nineveh which they razed to the ground. The Babylonians were again masters of Mesopotamia. But King Nabopolassar's dynasty, which held power for less than a hundred years, was the last period of Babylonian prosperity and glory.

The Babylonian King Hammurabi administers justice; in the background is his famous black law stone

Nabopolassar's son, Nebuchadnezzar, conquered Syria and Jerusalem, and took many Jews back into Babylonia. He was a great builder and completely transformed the city of Babylon; the famous *ziggurat*, known to the Jews as the Tower of Babel, dates from his reign, and the legendary Hanging Gardens of Babylon, one of the Seven Wonders of the World (see page 487), may also have been his work.

Detail from a bas-relief of an Assyrian hunt

The great Assyrian King Assurbanipal

(669–626 B C) engaged in a dramatic lion hunt. This is an imaginary scene based on the bas-relief shown above which was found at Nineveh, the ancient capital of the Assyrian empire

But the dynasty collapsed shortly after his death. The last king of Babylonia, Nabonidus (556–539 B C), spent most of his reign campaigning abroad in Arabia, while Belshazzar, who was possibly his son, acted as regent in Babylon. The days of Babylonia's glory were past; contemporary poems lament the decline of the great empire and blame unworthy rulers for neglecting both their gods and their duties. Nabonidus was criticised for forsaking Marduk and making the moon-god supreme in Babylon. By 539 B C the Babylonian empire had so degenerated that Cyrus, king of Persia, decided to attack it. Belshazzar was defeated at Opis. Babylon collapsed without a struggle, and the king Nabonidus was deported.

So ended the independent history of Mesopotamia, which now became a province of the Persian empire. Although Mesopotamia was to become a battleground, fought over for centuries by Persians, Greeks, Parthians, and Romans, the people kept alive their ancient customs and traditions until, in the 7th century A D, the conquering Arabs imposed their Muslim religion and culture. Finally, when the Mongols destroyed the irrigation system in the 13th century, the region became poor and arid desert land.

A tiled frieze of Persian warriors found in the royal palace at Susa, in Persia. In 539 B C the Persian army attacked and defeated the last Babylonian empire

ROMANIA

ROMANIA, or the Romanian People's Republic as it has been called since 30th December 1947, is a full member of the Communist bloc, lying well behind the Iron Curtain. From the time of their conquest by the Roman Empire onwards ('Romanian' really means Roman) through their subjection by the Turks to the regime of today the Romanians have been subject to oppression of one kind or another. Indeed it was the ruthless despotism of their tyrant kings before and after the Second World War, that made them so willing to accept Communism.

In the years before the war the vast majority of the people were desperately poor, at the mercy of the whims of a small aristocratic minority. About 80 per cent of the people were peasants who led lives of almost unrelieved misery, and whose homes were little more than shacks of mud and straw. They were subjected to absurd laws; for instance, a man could be sent to prison for lighting one cigarette from another rather than using a new match each time as the match monopoly laws directed. This, coupled with the sufferings of the Second World War, which involved the destruction of 80 per cent of their valuable oil fields, finally decided the Romanians that the monarchy must go. In December 1947 King Michael was forced to abdicate.

The country was in a dreadful condition. Squalor, near-starvation, and illiteracy were the lot of most of the population. Communism seemed the answer to the people's prayers, and so, encouraged by the Soviet Union, they adopted a Communist constitution. For nearly 10 years little news came out of Romania. But the Latin Romanians are more resilient than other Russian satellite peoples, the barriers are gradually breaking down, and the picture that emerges today is startling.

Though the Romanian standard of living is still among the lowest in Europe, it is far better than before the war. The industrial output has multiplied by four. Oil profits, from the rebuilt industry, help to import modern machinery. New factories and flats are shooting up, and illiteracy has been virtually wiped out among people between 14 and 55 years old. But these material gains have been won at the expense of freedom as we know it in the West, and it is very difficult for a Romanian to leave his country.

MOUNTAINS AND RIVERS

Romania is divided into three main regions. In the centre is a great arc of mountains – the Transylvanian Alps in the south and the Carpazi range in the north. These mountains are not high and are topped by plateau table-lands where farmers take their sheep for summer grazing. Except in the very highest areas the mountains are thickly forested. West of the central mountains lies the Transylvanian basin; this area and the mountain foothills are the main agricultural regions. Like the mountains, they were once covered by dense forest, but they have now been cleared for cereal, vine, and fruit cultivation. The third area, the great Danube plain, is swampy and threaded with the many rivers which flow down from the mountains to join the Danube. The river Danube, the southern boundary of Romania, is one of the country's principal freight transport routes.

Gently undulating scenery in the Transylvanian Alps

AGRICULTURE AND MINERALS

Romania is still a predominantly agricultural country. Over three-quarters of the population are farmers; their most important agricultural products are wheat, maize, and sugarbeet – in

A grain-carrying cargo boat in a Danubian harbour

Peasants from the Carpazi

THE TOWNS

Bucharest, the capital of Romania, is a dramatic mixture of the old and the new. There are many old churches and a unique museum of Romanian village architecture, but also huge modern buildings and smart new office blocks. The city is surrounded by lakes and forests and abounds with gardens. It has 18 theatres and the most beautiful permanent circus in the world – a wonderful marble and glass building in the traditional circus tent shape with a fluted sky-blue roof.

Other important towns are: Cluj, a university town; Constanta, a large port on the Black Sea; and Mamaia, Romania's brand-new holiday resort, also on the Black Sea.

The cathedral at Curtea-de-Arges shows how the East has influenced Romanian architecture

FACTS AND FIGURES ABOUT ROMANIA

Area: 91,700 sq miles

Population: 18,403,000

Capital: Bucharest (pop. 1,349,000)

Chief port: Constanta

Religion: Romanian Orthodox

Currency: Lei (about 6*d*)

Main imports: manufactured goods, raw materials, metals

Main exports: maize, wheat, barley, oats, petroleum, cattle

Typical Romanian farm

THE COAST AND THE CLIMATE

The Romanian coastline has no natural harbours, and the only port for big shipping is Constanta, the second port of the Black Sea after Odessa. In the Danube delta in mid-summer the weather can become sub-tropical, and pelicans, egrets, and rare tropical birds live there. In the mountains, where summers are very hot and the winters very cold, bears, wolves, elk, and lynx abound. These animals are the bane of the sheep farmers, and it is not unusual to see shepherds setting off to gather in their flocks for the winter armed with ancient rifles. There are often very strong winds in the mountains; one of the worst winter winds is the northerly *Crivat* which often does severe damage to crops.

that order. But Romania's greatest wealth lies beneath the ground. She produces about 11½ million tons of petroleum each year, about half of which is exported. Romania in fact produces no less than 50 per cent of the total oil production of Europe (excluding Russia). Lignite, fossil coal, salt, chrome, copper, iron ores, and bauxite are also mined.

There is a long-established steel industry in Transylvania which produces over 2,000,000 tons a year, and a new plant is being built at Galati, near the mouth of the Danube. Romania's natural gas output has expanded very rapidly during the last few years; some of it is piped to Hungary, but most is used for the Romanian chemical industry, which is the best co-ordinated of its kind behind the Iron Curtain. The advance of agricultural and industrial policies over the last few years makes it almost certain that Romania will very shortly be one of the most prosperous of Russia's European satellites.

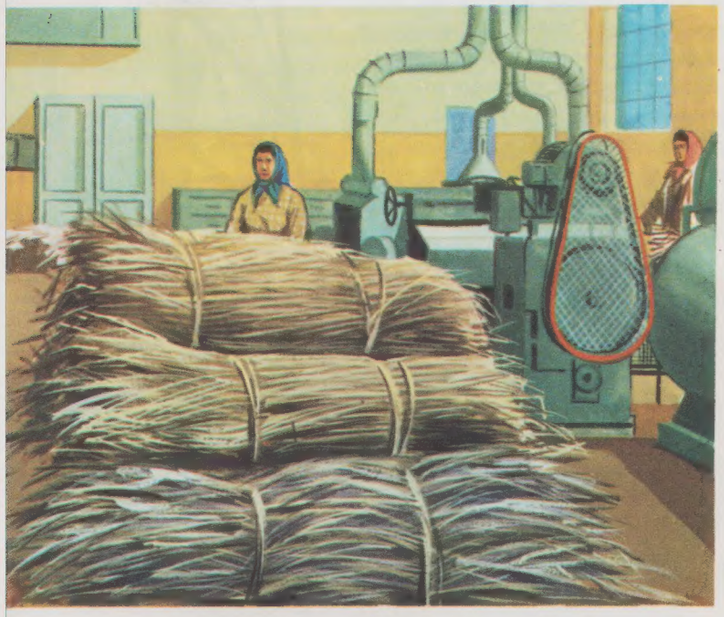
Petroleum wells at Ploesti, the Romanian oil centre

PLANTS IN INDUSTRY (part one)

MAN began to make use of plants long before he discovered the use of metals. For instance, in the Neolithic or late Stone Age (8,000 to 4,000 years ago) man was using string made from plants. We know this because pottery dating from this period has been found which is ornamented with impressions of twisted string. We also know that at the same time man had a crudely woven cloth. Fragments of it have been found together with tools and pottery of the period. This shows that 6,000 years ago people had already some idea of the great benefit plants could bring to mankind.

As men became more civilised they found that plants could be used in a great variety of ways: for food and timber, of course, and also to make oil, and sugar for sweetening food, and, in quite modern times, rubber. Plants have also been used from early times to make medicine, and many important medicinal drugs are still obtained from them.

As men discovered more and more useful plants they made progress in their methods of processing them. At first every family did this for themselves, spinning their own thread, weaving their own cloth, and preparing their own medicines from herbs found in the woods and fields. After a time certain people became professional weavers or druggists and sold their products. Later small factories or workshops were established. Now almost all processing of plant material is carried out in large factories by specialised industries, using elaborate equipment.



A stage in the manufacture of linen. The flax stems are allowed partly to decay ('retting') and are then crushed and combed by specially designed machines

FIBRE-PRODUCING PLANTS

These are plants which produce material for making cord and rope, and also thread for weaving into cloth of various kinds. The fibre may be obtained from the stems – for example, flax, hemp, and jute; from the leaves, like sisal; or from the downy hairs covering the seeds – the only example of this is cotton. All these plants are grown as crops in various parts of the world and form the basis of important industries.

Jute (Corchorus capsularis)

A sack and a mat made of jute

Sisal (Agave sisalana)

Rope made of sisal fibre

JUTE (*Corchorus capsularis*) is grown mainly in India, and a rather coarse fibre is prepared from it, which is used mainly for making sacks. The textile hessian is also made from jute.

SISAL (*Agave sisalana*), originally a Mexican plant, is now grown on a large scale in tropical Africa. The fibre prepared from its leaves is used mainly for making cord and rope.

OIL-PRODUCING PLANTS

Oil is produced from the fruits and seeds of certain plants and is used for cooking, for making margarine, for the manufacture of soap, and for lubricating machinery. Olive oil is the most highly valued of the edible vegetable oils.

OLIVE (*Olea europaea*) is a tree native to the Mediterranean region. It bears a fruit rather like a small plum, and oil is obtained both from the flesh and from the kernel of the stone. It is considered the best of all oils for cooking.

Flax (*Linum usitatissimum*)

Tablecloth and napkins made of linen

Alfa (*Stipa tenacissima*)

Basket made from alfa leaves

Cotton (*Gossypium herbaceum*)

A cotton handkerchief

Rope and string made of hemp

Hemp (*Cannabis sativa*)

FLAX (*Linum usitatissimum*) has been cultivated from very ancient times and its fibre is the source of the textile material called linen. After cotton it is the most important textile-producing plant. Flax is grown mainly in Europe and the Soviet Union.

ALFA or ESPARTO GRASS (*Stipa tenacissima*) is a native of southern Spain and parts of North Africa. The leaves are sometimes used for weaving baskets and mats, but the main use of the plant is to make pulp for producing paper.

COTTON (*Gossypium herbaceum* and other species) is the most important textile-producing plant. The fibre is very fine and comes from the downy covering of the seeds. The plant is a native of Asia, but the United States is now the largest producer.

HEMP (*Cannabis sativa*) was originally cultivated in India and is now grown also in the warmer parts of Europe. The fibre comes from the stem and is used to make sacks and rope. The very dangerous drug called hashish is also produced from this plant.

SESAME (*Sesamum indicum*) is a plant cultivated in India, Mexico, and parts of Africa and China. Edible oil is obtained from the seeds.

GROUND NUT (*Arachis hypogaea*). This is a plant with underground seed-pods. Oil is extracted from the seeds, which are the familiar peanuts.

CASTOR OIL (*Ricinus communis*). This is a tree native to tropical Africa. The oil from its seeds is used in medicine and also as a lubricant for aeroplane engines.

Coconut palm (*Cocos nucifera*)

COCONUT PALM (*Cocos nucifera*). A tall palm tree that grows in coastal regions throughout the tropics. The fruit is a large, heavy nut containing white flesh which is extracted and dried. From the dried flesh, called copra, a valuable oil is obtained which is used for cooking and soap manufacture.

Soap made from oil obtained from the coconut

HOUSE OF HOHENSTAUFEN

ON a crag 2,000 feet above the little Swabian village of Weiblingen stands the ruins of the castle of Hohenstaufen. Far to the south, near Bari in southern Italy, stands another castle, the Castel del Monte. There is a connection between these two castles, and it is one of the greatest and most romantic stories in the history of Europe. In the space of a hundred years a talented and energetic family changed their fortunes in the most spectacular way; from being minor Swabian lords they became Holy Roman Emperors. The castle of Hohenstaufen, which was at one time their only possession, gave its name to their dynasty. The Castel del Monte housed the last and most fabulous of the Hohenstaufen Emperors.

These Swabian lords first came into prominence when Frederick of Hohenstaufen supported the Swabian Emperor Henry IV (1056–1106) in his struggle with the Papacy (see page 773). In reward for loyal support, Henry IV married his daughter Agnes to Frederick, whom he made Duke of Swabia, or south-east Germany (see page 1745). Under Henry IV and his son Henry V (1106–1125) the Hohenstaufens were highly favoured, and Henry V obviously hoped that one of the two sons of Agnes would succeed him as Emperor. But there was a party in the Empire, led by the Guelph Duke of Bavaria and the Duke of Saxony, which was bitterly opposed to the Hohenstaufens. When Henry V died in 1125 it was Lothair of Supplinburg, Duke of Saxony, who was elected Emperor, and for a brief period the Hohenstaufens were eclipsed. Lothair married his daughter to Henry the Proud, Duke of Bavaria, and so allied himself with the powerful Guelph family. But when Lothair died in 1137 the German nobility felt the Guelph faction had become too powerful so they elected Conrad of Hohenstaufen (1138–1152), the second son of Frederick of Swabia and Agnes. Conrad was a popular ruler but had little success as statesman or soldier. The Second Crusade (1147–1149), in which he took part, was a complete failure. On his deathbed he realised that a strong hand was needed to save the fortunes of his house, and he told his friends to disregard the claims of his young son to the throne and elect his nephew Frederick Barbarossa, Duke of Swabia.

FREDERICK BARBAROSSA

Frederick Barbarossa (1152–1190; see page 977) was the first of his house to be Holy Roman Emperor – Conrad was merely a king because he was never crowned by the Pope. Like his uncle, Frederick was popular, but there was much more to him. He wanted to be Emperor in the true sense and it was to the earlier Roman Emperors rather than to Charlemagne (see page 42) that he looked for his inspiration. 'During his reign,' a chronicler wrote, 'nothing was nearer to his heart than re-establishing the empire of Rome on its ancient basis.' His ideas brought him into conflict with the Papacy. The Pope considered the Emperor held his empire from the Pope. Frederick said he held it 'through the election of the princes from God alone'. Frederick's reign was not only disturbed by quarrels with the Pope, but also with the towns of north Italy and the Guelph Duke of Saxony and Bavaria, Henry the Lion, all of whom found it in their interests to support the Papacy. Against the Pope and the towns of north Italy, led by Milan, Frederick lost. Against Henry he won. But he was always a magnanimous enemy, and he sent his ambassador to Pope Adrian IV's funeral as a token of respect to his dead enemy. He harboured no grudge against the Milanese for defeating him at Legnano in 1176, nor against the Pope for triumphing over him at the Peace of Venice in 1177. He died in a typical manner while on crusade, trying to swim a fast-flowing river.

THE HOUSE OF HOHENSTAUFEN

Frederick of Hohenstaufen, D. of Swabia (d 1105) m. Agnes (daughter of Emperor Henry IV)

- Frederick, D. of Swabia (d 1147)
  - FREDERICK I (Barbarossa, 1152–1190)
    - HENRY VI (1190–1197)
      - FREDERICK II m. Constance of Sicily (1212–1250)
        - CONRAD IV (1250–1254)
          - CONRADIN (d 1268)
        - Manfred (d 1266, illegitimate)
    - PHILLIP OF SWABIA (1198–1208)
- CONRAD III (1138–1152)

A simplified family tree of the Hohenstaufens

Frederick II's gold imperial seal – the abbreviation 'Rex Jer' shows that he was King of Jerusalem – a title which he gained on crusade

To Frederick II's court came many of the most

HENRY VI

Frederick's son Henry VI (1190–1197) was not a likeable man but might have been the greatest of all mediaeval Emperors had he lived longer. In the brief period of his rule his power was immense. All Italy was under his control – by his marriage to Constance of Sicily that kingdom became his. Richard Coeur de Lion (see page 126), who fell into his hands when returning from crusade, became his vassal. Germany was obedient. The King of Cyprus did him homage. The proud Byzantine Emperors (see page 562) treated him with respect. However, he failed in one of his main ambitions – to conquer the Byzantine empire. In 1197 he died before his great invasion fleet could set sail.

FREDERICK II

Henry could not be succeeded immediately by his son Frederick II (1220–1250) who was a minor, and so a civil war broke out in the empire between Henry's brother Phillip of Swabia and the Guelph Otto of Braunschweig. But in 1220, ironically with the full support of the Papacy, Frederick II (see page 609) became Emperor. To the Germans this young man

from Italy was a wonder; soon they were calling him *stupor mundi*, or the wonder of the world. And Frederick agreed with the verdict of his contemporaries. He signed his documents 'Emperor of the World, Friend of Peace, Protector of Love, Founder of Law, Preserver of Justice, Son of Power, who rules the world'. Popes soon became horrified by this daring new ruler; Frederick's greatest enemy, Pope Innocent IV, was to write: 'He has three rows of teeth in his jaws: for the monks, clerks, and innocent laity.' Conservative churchmen heard with horror of his friendship with heathen Saracens, and of his inquiring mind which questioned even the most established beliefs. His questions to his astrologer, Michael Scot, show on what lines his mind was working. 'How is the earth fastened above the abyss of space?' 'In which heaven is the God substance?' 'Where is hell, purgatory, and heaven?' Frederick exercised his brilliant mind on all sorts of subjects. He wrote a scientific treatise on falconry, and kept a menagerie. There was something almost amoral about him which disturbed the men of his times, and some labelled him Anti-Christ. The truth was that he was born out of his

brilliant men of his age – its daring spirit horrified many of his contemporaries

time. He was more like a man of the Renaissance in his cruelty and the lengths to which he went to obtain his own ends. 'If I had one foot in Paradise,' he said of a defiant Italian city, 'I would withdraw to take vengeance on Viterbo.' And there were many who believed him.

His government was well organised. 'In your kingdom of Sicily,' wrote Pope Gregory IX, 'no man dares move a hand or foot save at your command.' His judicial system was the most advanced in Europe, and he abolished trial by ordeal.

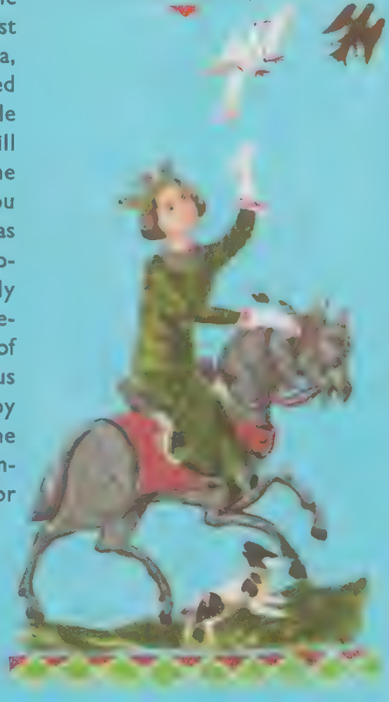
Yet despite this fantastic aura of genius that surrounded him, Frederick was less powerful than both his father and grandfather. He spent much of his reign in minor Italian wars and just before his death received a crushing defeat from the city of Parma. His main enemy was always the Pope, who objected not only to Frederick's imperial pretensions, but also to the fact that, being both the King of Sicily and the Emperor, he was much too powerful in Italy. In 1250 Frederick died. So great an impression had he made on contemporaries that some refused to believe that he was really dead. Years after his death, bets were laid in Florence as to whether or not he was alive.

THE LAST OF THE HOHENSTAUFENS

Frederick was the last Hohenstaufen Emperor. There was never any question of his son Conrad (1250–1254) being crowned Emperor. Innocent IV wrote: 'Root out the name of Babylonian [Frederick II] and what remains of him, his succession, and seed.' Conrad died in 1254, leaving his quarrel with the Papacy undecided.

After his death the Hohenstaufens were led by Manfred, an illegitimate son of Frederick II. He became so powerful that the Pope appealed to Charles of Anjou, brother of the French king, to become King of Sicily and replace Manfred. To this Charles agreed, and defeated Manfred at the battle of Grandella, near Benevento. Seeing all was lost, Manfred rode into battle to his death. There was now one remaining hope for the Hohenstaufens: Conradin, 15-year-old son of Conrad. It was now or never for his house. In 1268 he crossed the Alps into Italy. At first all went well. Pavia, Pisa, and Rome opened their gates to him. He pressed on south, till late in the summer he met Charles of Anjou at Tagliacozzo. He was defeated and later captured, and shortly afterwards he was executed in the city of Naples near the famous Capuan Gate, built by his grandfather. The rule of the Hohenstaufens had ended for ever.

A contemporary picture of Conradin hunting with a falcon – his grandfather wrote a scientific treatise on falconry



The Castel del Monte still stands in southern Italy – a memorial to the last and most spectacular of all the Hohenstaufen emperors

THE COPTIC CHURCH

TODAY there is a growing demand for Christian Unity. This is more than just a desire for unity between Roman Catholics and Protestants; it is a movement which seeks to unite a great number of Christian Churches in the East which are neither Protestant nor in communion with Rome. The largest of them is the Orthodox Church, and others include the Nestorian Church of Iraq, Iran, and Syria, the Armenian Church, the Ethiopic Church, and the Coptic Church of Egypt.

The word *copt* is derived from Arabic and Greek and means simply 'Egyptian'. It has come to mean Egyptian Christians.

Egypt was one of the earliest homes of Christianity. According to tradition Christianity was introduced there by St Mark the Evangelist, and Alexandria became one of the ancient and venerated patriarchates of the Christian world.

The breakaway

Yet Egyptians resented being dominated by the government of the Roman Empire; even if they had to have Imperial governors they were not going to have an Imperial religion, which was by this time Christianity. So Egypt was ready to adopt the persuasive 5th-century *Monophysite* heresy. Monophysites believe that there is only a divine nature in Christ, as opposed to the Catholic teaching that Christ has both a human and divine nature. The patriarch of Alexandria, Dioscoros, became a leading Monophysite. His teaching was condemned in 451 at the Council of Chalcedon, called by Pope Leo I, but the bulk of the Egyptian bishops and people decided to ignore the Pope. So the Egyptian Church became separated from the Catholic Church of Rome. In 567 two separate lines of patriarchs were established; one (Coptic) was Monophysite, the other was Orthodox. That is still the position today.

In 641 Egypt was overrun by the Arabs, who set about imposing their Muslim religion on the Egyptian Christians. They were so successful that today no less than 93 per cent of the Egyptians are Muslims.

The Christian minority in Egypt has never had an easy time and suffered centuries of persecution under successive waves of Arabs, Mamelukes, and Turks. In the 19th century internal squabbles added to their problems.

These quarrels reached their climax in 1892 when a radical reform party deposed the patriarch, Cyril V, and confined him in a monastery. This was too much for the majority of Copts; he was reinstated and died in full authority in 1927.

The election of the patriarch who governs from Cairo is in the hands of a group of bishops, lower clergy, and even important lay people. Sometimes the final choice is made by lot, as was the case in the election of Cyril VI in 1959. The patriarch is assisted in his duties by a religious council consisting of four bishops appointed by himself. There are some 20 bishops in all, including bishops for Coptic immigrants in South Africa and Nigeria. The bishops are, on the whole, learned, cultured men, but the lower clergy are almost all uneducated and untrained. There are very few seminaries, and many priests are drawn from the lowest classes of the community. Deacons are often ordained when they are only 14 or 15 years old, although Coptic rites demand that they should be 25.

A dignitary of the Coptic Church. Behind him stands a priest of lower rank

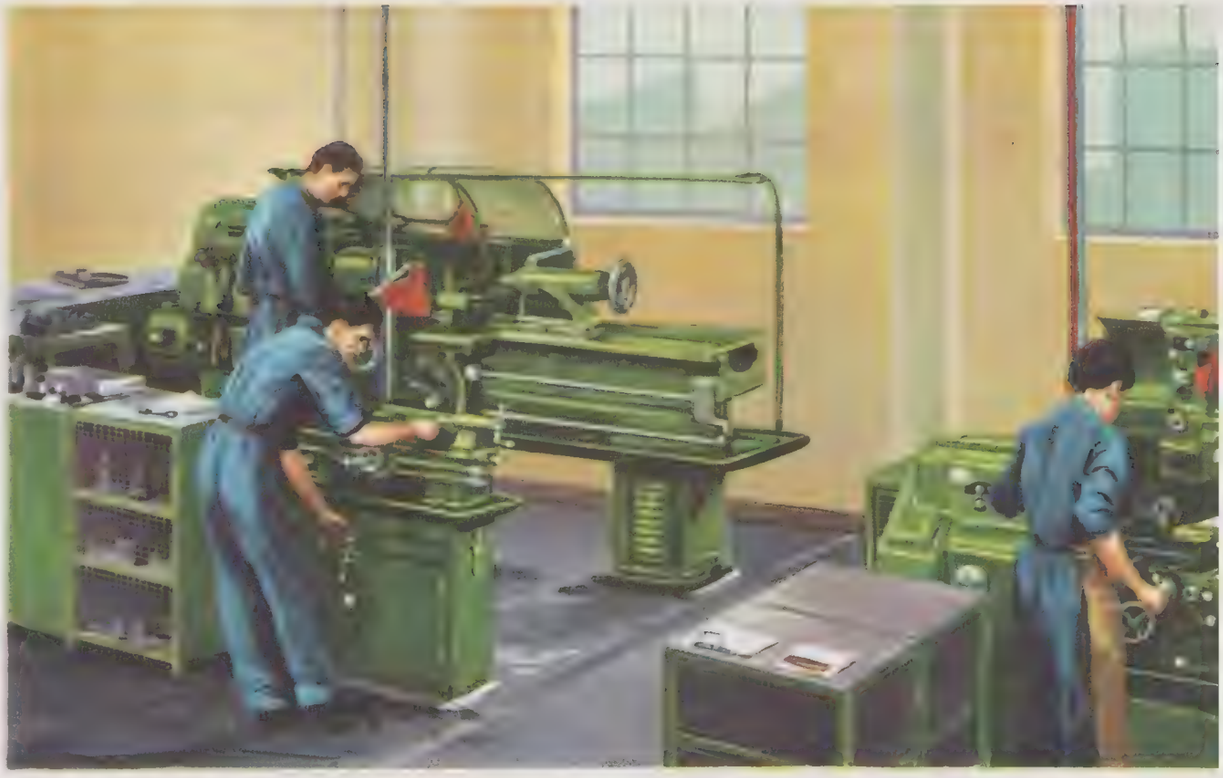
Decline of the monks

Once monasticism was widespread all over Egypt. There were hundreds of monasteries and thousand of monks. But today there are only eight monasteries and some 300 monks. In these monasteries the monks' lives are extremely harsh and austere. They do numerous penances and eat little but bread and dried beans.

There are about 1,350,000 members of the Coptic Church, representing only 6·6 per cent of the population of Egypt. Yet even this tiny number is today threatened by an increasing danger – defection to Islam. With the growth of Arab nationalism, and the work of President Nasser, more and more Arabs are beginning to feel unpatriotic if they belong to any but the Muslim religion, and so the position of Coptic Christianity is extremely precarious.

Coptic churches are built on a rectangular, basilica-like pattern. Their ceremonial is elaborate and their sacraments are considered valid by Rome. Thus if a Copt becomes a Roman Catholic he does not have to be re-baptised or re-confirmed or make a first general confession. Nevertheless there are differences between the Roman and Coptic uses of the sacraments. Coptic Christians rarely go to confession or to Holy Communion, and Communion is received as both bread and wine. Extreme Unction is ministered to Copts when there is no danger of death and even to some who are completely healthy as a precaution against illness.

Coptic Christianity has made little progress except in Ethiopia, where for many centuries Christianity was dominated by Egypt. Shortly before the Second World War the Ethiopic Church began to demand independence, and in 1950 this was achieved. Ethiopian Christians are still known as Copts and acknowledge the headship, but not the jurisdiction, of the Egyptian patriarch.



A corner of a metalwork shop. The machine tools are all powered by electricity, and operated by skilled workmen

MACHINE TOOLS

HAVE you ever wondered how hard metals can be shaped to make, for example, the Big Wheel at the Fair? Machine tools are the instruments used for cutting, scraping, hammering, or squeezing hunks of metal into the necessary shapes, and we are going to examine some of them. The most important machine tools are the lathe, the drilling, milling, and boring machines, the grinder, and the planing machine.

All these machine tools work on metal like other tools which are used on softer materials. The lathe peels off shavings from metal in much the same way as you would peel a potato. The drilling machine bores holes in metal as a carpenter bores holes into wood with a brace and bit. The boring machine smoothes holes already bored, in the same way as a woman trims the inside of a cored apple. The planing machine is almost the same as a carpenter's plane – the difference being that whereas the carpenter moves his plane across the wood, here the metal moves while the cutter is still. Machine tools play a vital part in the manufacture of all kinds of metal goods. Out of sheets, bars, or blocks of metal they produce huge pieces necessary to build and drive giant battleships or aeroplanes. They produce the carefully designed mechanisms of motor-cars, typewriters, and television sets, and manufacture the minute precision instruments required by the smallest watches and cameras. Some machine tools can turn out a piece of metal with the exact shape and measurement required to within one-tenth of a thousandth of an inch!

The cutting tool

Cutting tools are quite simply powerful instruments capable of cutting metals. They can be attached by clamps to any machine tool, and as that machine does its work so the metal is cut wherever necessary to the appropriate size and shape. For example, on the lathe the metal to be worked is held firmly in place by metal jaws called a *chuck*. The chuck revolves, and as it does so the metal revolves too. Then the operator brings the cutting tool up to the piece of metal by winding a handwheel and so is able to reduce the metal to the required size.

Of course there is a lot to be done before the metal is finally shaped as the engineer wants. Just as a carpenter or indeed a sculptor will use a variety of chisels when working on a piece of wood, marble, or plaster, the workshop operator will have to change the cutting tool at each stage according to his immediate requirements, for cutting at different speeds, thicknesses, and widths. Apart from the different cutting tools, the operator will almost always have to use a number of different machine tools before he has perfected his task.

HIGH-SPEED STEELS

How do cutting tools peel large shavings from blocks of steel or cast iron? Remember that the cutting tool produces vast amounts of friction when it is pressed against the metal workpiece. Either the tool or the workpiece is turning incredibly fast. Why, then, does the tool not melt and lose its cutting edge?

The answer is that metallurgists (engineers who study metals) have created toughened alloys of steel which remain hard even at very high temperatures. These are the *high-speed steels*. In recent years carbides of tungsten, cobalt, tantalum, titanium, and vanadium have been used as high-speed steels. They are so hard that they register about 9·6 on Moh's scale of hardness (diamond, the hardest substance of all, registers 10, while talc, the softest, registers 1). These carbides are very expensive and no tool is made entirely of them. Instead an ordinary steel tool will be tipped with a small plate of carbide, and in this way the tool will keep its keen cutting edge for much longer.

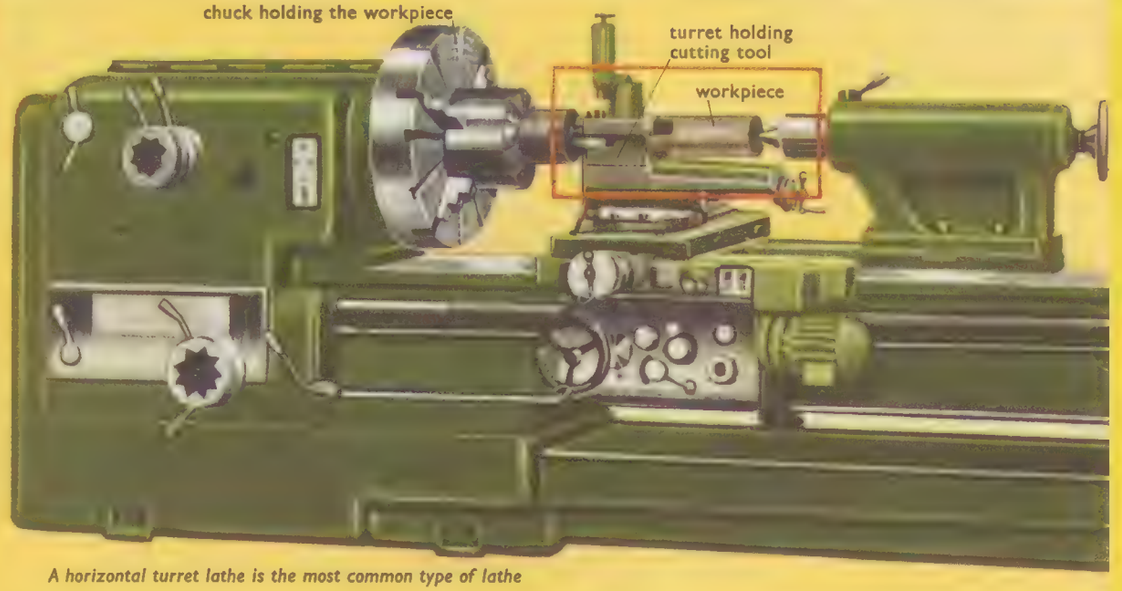
Carbide-tipped cutting tools used on a lathe

THE LATHE

Cylindrical objects, like rods, are *turned* (shaped) on a lathe. Lathes can also be used for boring holes, and for *tapping* (making the thread of a screw).

The metal which is to be shaped is known as the *job*, or *workpiece*. It is placed between the clamp or *chuck* (on the left in the illustration) and the *centre* (on the right). The workpiece spins round at different speeds (which depend on the job being done) while the cutting tool is applied to it.

The cutting tool is fixed to a post or *turret* that can be moved along the workpiece on slide rests. It can also be moved backwards or forwards to make cuts of different depths.

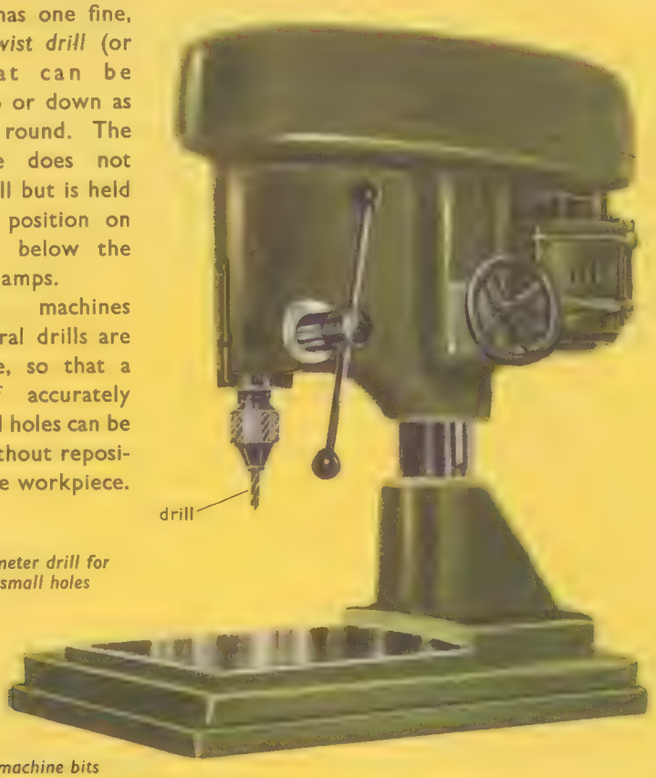


A horizontal turret lathe is the most common type of lathe

THE DRILL

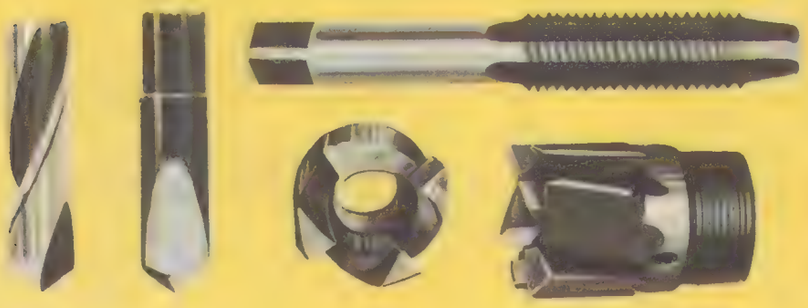
This high-speed drilling machine has one fine, vertical *twist drill* (or *bit*) that can be moved up or down as it spins round. The workpiece does not move at all but is held firmly in position on the table below the drill by clamps.

Drilling machines with several drills are also made, so that a series of accurately positioned holes can be drilled without repositioning the workpiece.



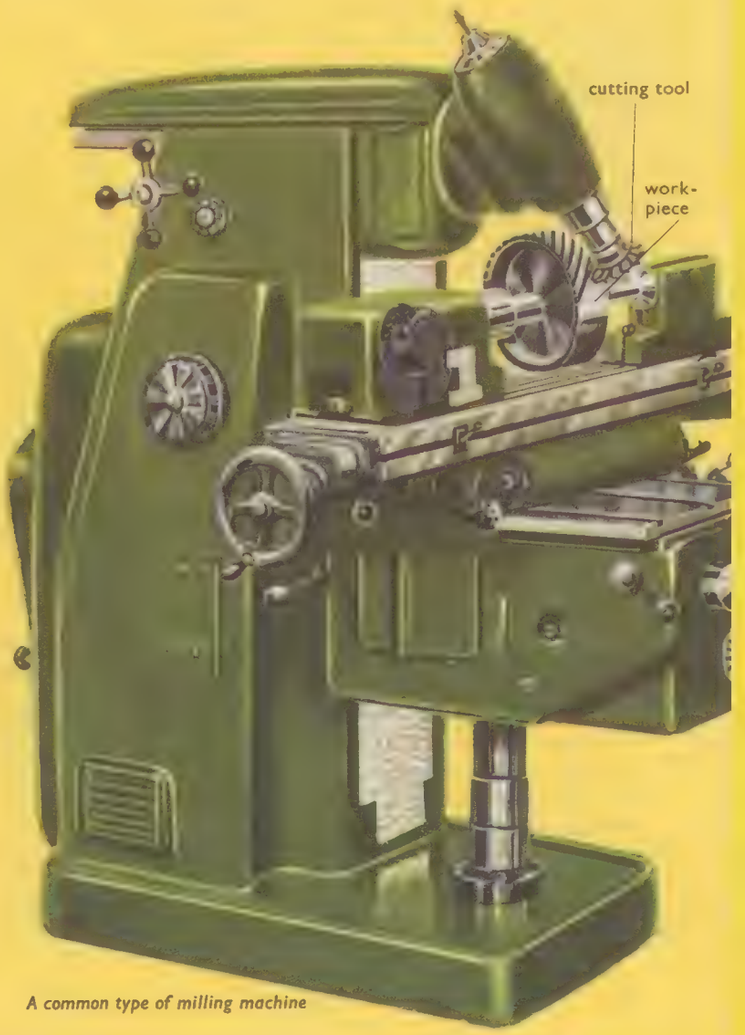
A fine-diameter drill for making small holes

Drilling machine bits



THE MILLING MACHINE

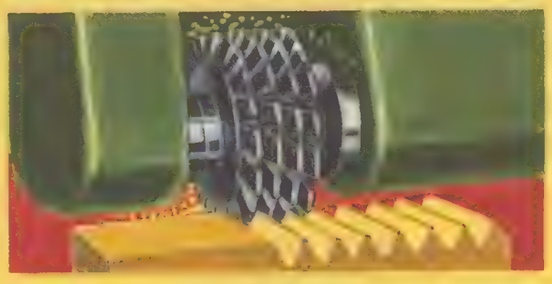
The milling machine has a great number of uses. Specially shaped cutters are fixed to a head which can be positioned at different angles. The workpiece is attached to a table under the cutter. Flat surfaces, slots, and grooves are among the many shapes the milling machine can cut.



A common type of milling machine

Here is a lathe in action, turning metal. The cutting tool is moving along the rotating workpiece, shaving off metal and reducing its thickness at one end.

The cutters of a milling machine can be adjusted to work vertically or horizontally. Here four toothed cutters are revolving, and rapidly cutting a series of grooves in a metal bar.

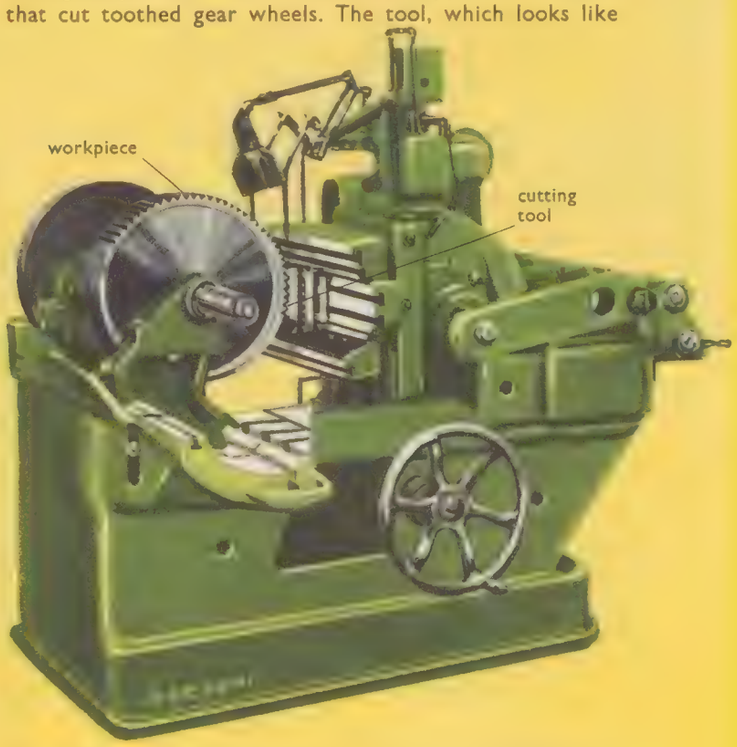


THE FILING MACHINE

This machine replaces filing by hand

GEAR-CUTTING MACHINE

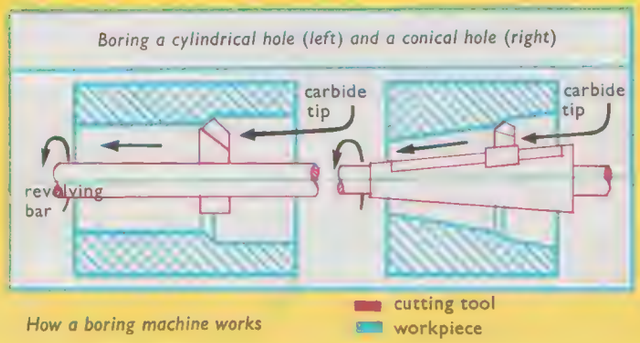
This gear planer is one of the three types of machines that cut toothed gear wheels. The tool, which looks like



the blade of a saw, moves from side to side against the workpiece and produces a series of identical teeth as the workpiece rotates.

BORING MACHINE

This machine tool is used to finish off, with great precision, holes drilled in pieces of metal. The cylinders of a petrol engine, for example, need to be completely even and smooth inside to prevent loss of power. The workpiece is fixed in position, and the cutting tool, fixed to a revolving bar, moves horizontally through it.



How a boring machine works

Two other machine tools play an important part. The *planing machine* levels flat surfaces to a regular evenness. It has one fixed cutter, under which the work piece, held firmly in clamps, moves backwards and forwards. The cutting tool in a *grinding machine* is a wheel, that can put a smooth, highly-polished surface on to metal objects that, because of their angular or threaded shape, cannot be planed.

Today the largest and most mechanised industries use special machine tools. With these, not one but a whole series of different operations such as drilling, boring, threading, and shaping can be carried out by only one machine. Because the workpiece is automatically transferred from one cutting tool to the next without any human assistance, these are called *transfer machines*.

GREAT WATERFALLS OF

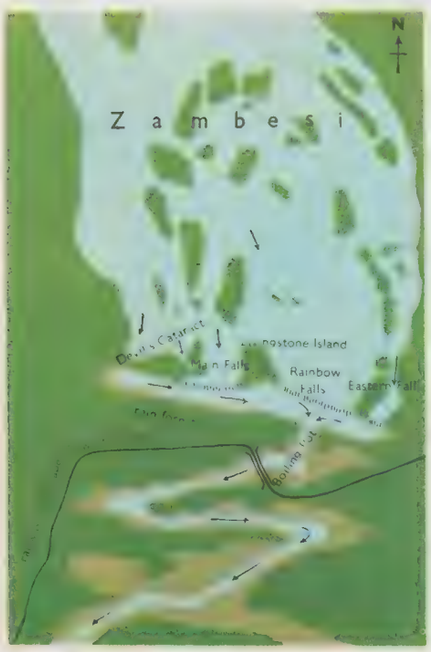
Physical map of Africa

THE continent of Africa is wild and difficult to penetrate. Its high central plateau contains vast deserts and dense forests, and is surrounded by mountain ranges that fall steeply into the sea. Through this varied terrain flow some of the world's greatest rivers. They follow the winding valleys of the plateau, and sometimes, when the level of the river changes, tumble dramatically down in waterfalls. Gradients of varying steepness form different sorts of waterfalls. A *fall* is water flowing over a drop so sheer that the river falls free to the plunge pool below, losing contact with its bed. Falls of tremendous volume are called *cataracts*. A less steep gradient causes a *cascade*, or series of falls, over which the river flows while still keeping contact with the rock beneath. *Rapids* occur where the slope is more gentle.

The water level of African rivers varies considerably according to the time of year; raging torrents die away to a mere trickle in the dry season even where the main river is joined by tributaries. In desert areas much of the river water is drawn off for irrigation. These frequent changes in level, together with the many waterfalls, make it almost impossible for steamboats and other craft to use many of the rivers, except over certain stretches for a few months at a time. Frequent detours into the forest have to be made, but the dense undergrowth beside the rivers is a further hindrance to travel. It is for this reason that Africa remained so long unexplored (see page 2156).

The Victoria Falls

About halfway between the source and the mouth of the Zambezi is the most spectacular waterfall in Africa. Here the river is over a mile wide and dotted about with small islands.



Aerial view of the Zambezi, showing the position of Victoria Falls

A continuous roar can be heard several miles away. Jets of spray leap upwards into the sunshine, forming brilliant rainbows. A cloud of mist hangs over the forest, as this great river disappears through a slit or fissure set at right angles to its path, and hurtles some 400 feet down into a gorge.

At the eastern end an outlet, known as the Boiling Pot, leads into a 45-mile-long canyon, only 400 feet wide in places, before the river widens once more. *Mosi-oa-tunya* is the local dialect name for the Falls, meaning 'smoke that thunders'. David Livingstone, who discovered the Falls, named them after Queen Victoria in 1855.

The Victoria Falls, Africa's most magnificent spectacle,

Victoria Falls are remarkable not only for their height and volume, which is greatest during the flood period from April to June, but also because the general level of the land is the same where the water tumbles over, and on the opposite side (see above right).

The mile-wide cataract, between 200 and 400 feet high, is divided by islands into the Main Falls (with the Devil's Cataract), Rainbow Falls, and the Eastern Falls. In the dry season it is possible to walk across the Eastern

seen from the canyon

Falls and swim in 'the armchair', a natural pool on the very edge of the precipice. About 400 feet away is the opposite wall of the gorge, and in between the base of the Falls is hidden in boiling mist.

Below Victoria Falls a railway bridge (built in 1904) spans the gorge. At the end of the canyon there is a hydro-electric station to harness the power of the Falls, which is several times greater than that of the Niagara Falls in North America (see page 2196).

Victoria Falls seen from above. The rising spray catches the light and forms rainbows

THE RIVER CONGO

The Congo, about 2,900 miles long, is the second longest river in Africa after the Nile and has the greatest number of waterfalls. It rises as the Lualaba River, 4,560 feet above sea-level in the Katanga tableland. The Lualaba is partly navigable, but frequently broken by rapids, and becomes the Congo at the Equator. Above Stanleyville the Congo rushes over the seven cataracts of the Stanley Falls, dropping 200 feet in 60 miles. Its width increases to 8 miles as it sweeps westwards, becoming navigable for most of the year for over 1,000 miles. The river narrows to 1 mile wide before spreading out into the Stanley Pool, a vast swamp 20 miles long and 13 miles wide, 350 miles from the mouth of the Congo. Below Leopoldville the river bed plunges again – over 32 falls named after David Livingstone – dropping 850 feet in 220 miles. Stanley was the first explorer to conquer these rapids, when he succeeded in journeying down them in 1877.

The river Nile

The remotest headstream of the White Nile is the Luvironza River, which rises about 3,700 feet above sea-level and flows into Lake Victoria. It emerges as the Victoria Nile, and later flows over the Owen Falls Dam, where it drives a major hydro-electric station. It drops 400 feet into Lake Albert over three steps only 19 feet wide, known as Murchison Falls. Further north it breaks up into many rapids as the flat countryside abruptly changes level. Between Khartoum (where the White Nile and Blue Nile unite) and Aswan the river descends 935 feet over six famous cataracts.

The Blue Nile leaves Lake Tana in a cascade

OTHER GREAT FALLS

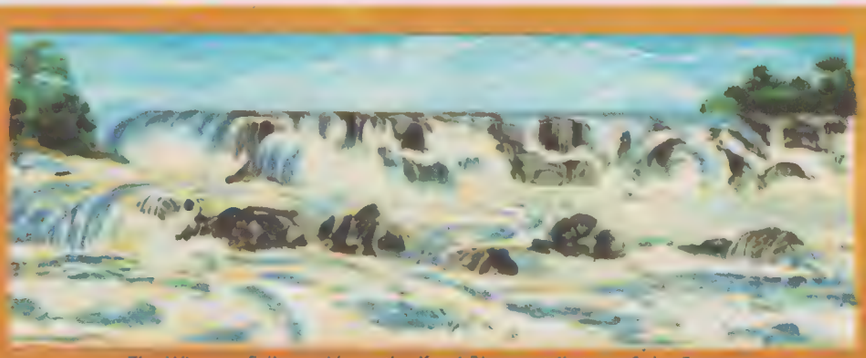
So far we have described the falls on the most important African rivers. But some of those on smaller rivers are higher than the Victoria Falls, although their fame is much less. They are:

Tugela Falls, river Tugela, Natal: a series of cascades dropping over 2,800 feet;

Kalambo Falls, river Kalambo, Rhodesia: 3,000 feet over 6 miles, including a sheer drop of 704 feet;

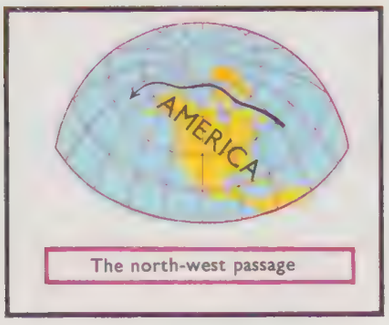
Maletsunyane Falls, Orange River, Basutoland: 630 feet;

Aughrabies Falls, Orange River, Cape Province: 480 feet.

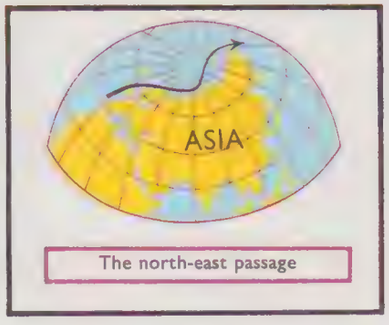


The Wissman Falls, rapids on the Kasai River, a tributary of the Congo

VITUS BERING



The north-west passage



The north-east passage

THE idea of sailing 'round the world' to the fabulous lands of China and Japan haunted European explorers in the Middle Ages. It developed in the 16th century into the theories of the 'north-west' and 'north-east' passages – those routes 'over the top' of America and Asia to the Far East. There are indeed such passages. One is to the north of Siberia, the other is to the far north of Canada. But the Arctic is so cold and desolate, storm-ridden and dangerous, that in the days when exploring had to be done in wooden sailing ships only the bravest and most intrepid of men would journey into such regions. Vitus Bering was such a man.

Vitus Bering was born at Horsens in eastern Denmark in 1681. He went to sea as a young boy and learned his skills as a sailor in Danish ships. But he sought a more exciting outlet for his ambitions than sailing on Danish trading expeditions, and in 1704 he joined the Russian navy where he became known as Ivan Ivanovitch. This was the most important decision of his life, for he became involved in the grandiose schemes of Peter the Great (see page 2172) to explore the north-eastern shores of the Asian continent. By the beginning of the 18th century Russia had grown enormously from the original tiny mediaeval state of Old Muscovy. It had expanded in the north and west towards the Baltic Sea, and south towards the Crimea. It had also expanded east with its boundaries across Siberia towards the extreme limits of the Asian continent. The north-eastern extremity of the Russian state captivated the imagination of Tsar Peter, and in Vitus Bering he felt he had a man who could one day answer all the questions which men of those days asked about the unknown Arctic. Peter, too, wanted to learn about this uncharted region which he hoped to make his own, and to discover whether the American and Asian continents were joined together or whether they were separate. In 1724, only a year before his death, the Tsar summoned Bering and invited him to prepare an expedition to explore the Arctic coasts of Asia and America.

The expedition consisted of only two ships and 25 men. The men assembled at Okhotsk, a base on the coast of eastern Siberia, and set about building their boats, the *Fortune* and the *St Gabriel*. By 1726 they were ready, and with his handful of men Bering sailed north up the Siberian coast. He passed the peninsula of Kamchatka and soon approached the tip of Asia. Then between 10th and 15th August he passed through the great strait which separates Asia from America – today called the Bering Strait.

Almost immediately Bering turned back, since autumn was approaching and with it came the danger of being frozen up. He was received with acclaim in St Petersburg by the Tzarina Anna who had succeeded Peter, and he was able to tell her that Asia and America were in fact separate continents.

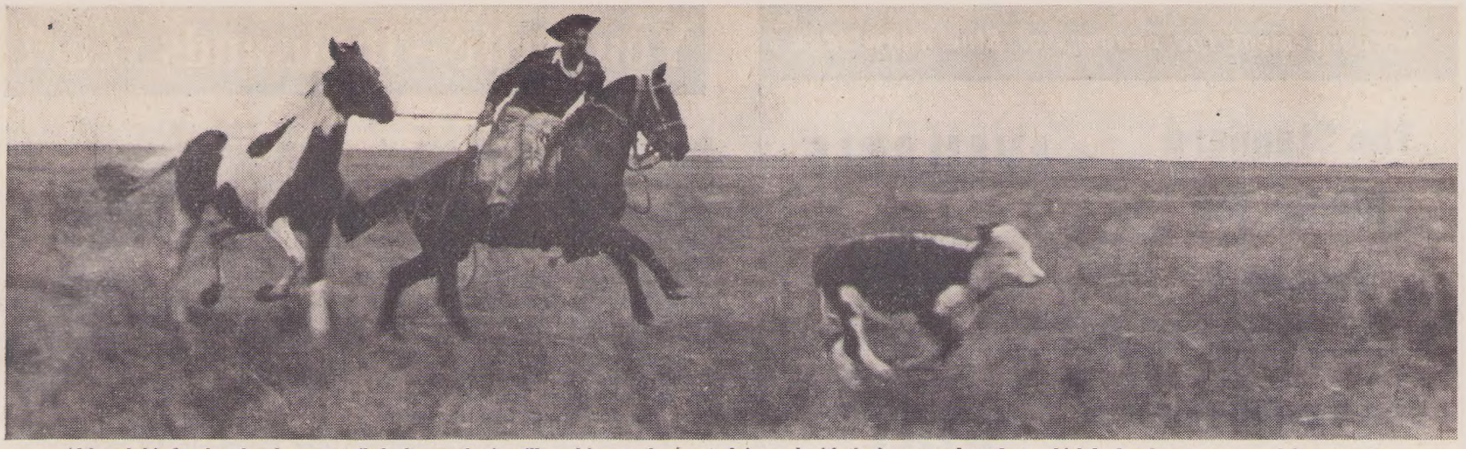
JOURNEY'S END

Bering now prepared for a second and far greater voyage. Two much larger ships, the *St Peter* and *St Paul*, were built, and in 1740 they set sail for Kamchatka and founded the town of Petropavlosk (that is, 'Peter' and 'Paul') in honour of his two ships. Then on 4th June 1741 he embarked on his last voyage towards the northern wilderness.

He had been at sea barely a fortnight when a violent storm separated the two ships. They were never to meet again. The *St Paul*, commanded by Captain Cirickov, reached the American coast near the Queen Charlotte Islands before he turned back and arrived in Petropavlosk on 21st October 1741. But Bering was to have a very different fate. He, too, reached the American coast, at a point further north than his companion ship. With the terrible northern winter approaching, he turned south-west for home. We know he made two stops, probably to shelter from storms. One was at Kodiak and the other was at some Aleutian island. But the terrible Arctic winter was gathering its strength. The fierce icy rains were falling almost incessantly, and a perpetual blanket of dense and treacherous fog descended as an added and appalling hazard. Battered ceaselessly by the weather, the ship limped on under dreadful conditions for 40 days. The crew were cold and desperate.

Finally on 16th November the exhausted men reached a remote island over 200 miles from the safety of Kamchatka. They dragged themselves ashore and prepared to endure the terrible winter. They had neither fuel nor food. Somehow a few managed to survive by hunting the all-too-rare fox or seal until in the summer of 1742 the handful of survivors built a boat which took them home.

But Bering himself had long since reached the limits of his great endurance. In the first days of December 1741 he realised the end was near. He refused to eat or stay in the crude hut the men had built for him. Instead he asked to be carried into the open and left to die in the biting elements of the desolate place that is today called Bering Island. He died as he wanted, facing towards the sea which had been his love and his life, his triumph and his tragedy.

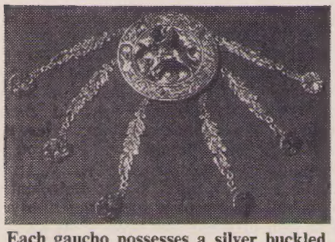


Although his freedom has been curtailed, the gaucho is still working on the great plains and with the horses and cattle to which he has been accustomed for centuries.

COWBOYS OF THE SOUTH

The former rulers of the pampas have had to adapt themselves to a new way of life.

Not all gauchos come from Argentina. This is a Uruguayan gaucho, and there are Chilean gauchos too.



Each gaucho possesses a silver buckled belt, and it is said that in the whole of South America no two buckles are alike.

From behind you can pick out a gaucho by the long knife hanging from the back of his belt.

OVER large areas of southern South America stretches a vast plain – a great green ocean rolling as far as the eye can see and much farther; a plain in which you would be as likely to meet a man as you would another ship in the ocean. This plain, known as the *pampas*, was once the private domain of the cowboys of the south – the *gauchos*.

The word gaucho probably comes from the American-Indian word meaning 'vagabond'. The gauchos were half Indian and half Spanish, and until about 100 years ago wandered across the pampas, rarely settling anywhere for long.

The bolas

Their livelihood was based on cattle and horses, and they were skilful in the management of both. They were excellent riders, more at home on the horse than on foot. Indeed there is the famous story of a gaucho dentist operating on horseback. They were expert at rounding up horses and cattle, especially with the help of the *bolas*, which are still used today. These are two or three stones fastened to leather thongs at the end of a long cowhide line. The gaucho swings the thongs around and then releases the bolas at the animal to be caught. The bolas twine themselves round the animal's legs, tripping it up. Naturally great skill is needed in this because the animal can easily be injured.

An Argentinian gaucho – it is said that a gaucho is more at home on a horse than on foot.

The gauchos were almost fanatically loyal to their leaders or *caudillos*. Indeed the gauchos were once a prominent force in Argentinian politics. From 1835 until he was deposed in 1852 one of their caudillos, Manuel de Rosas, governed Argentina tyrannically, frequently making war on its neighbours.

End of freedom

With the fencing of large ranches in the latter half of the 19th century the nomadic life of the gauchos came to an end. However, the ranchers found the gauchos valuable people to have working for them because of their expert knowledge of horses and cattle. Today gauchos are almost entirely employed on the ranches. They have, it is true, lost their original freedom, but they are still working on the great plains and with the horses and cattle to which they have for so long been accustomed.

And to a certain extent the romance of the gauchos lives on. In Buenos Aires, capital of Argentina, there is a famous statue of a gaucho, and there is also an Argentinian expression, 'es muy gaucho', meaning 'he is a good fellow'.

◀ Although the gauchos are experts where horses are concerned, they sometimes have a considerable struggle to saddle an unbroken horse. Occasionally it needs 12 or 13 of them to cope with these equine tantrums.

Announcement for readers of Blue Knowledge

The Standard Binder for Volume 4 — **AVAILABLE NOW**

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The standard binder for Volume 4 is available now. The Easibinder for Volumes 3 and 4 is also still available. See your newsagent right away, or, in case of difficulty, write to Department B, 'Knowledge', 37 Hertford Street, London, W.1.

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Remember – copies are better in a binder.

This issue contains the title page and table of contents for Volume 4. *Next week's issue will contain the index for Volume* 3.

You write – thousands read!

Instant Speech

DEAR EDITOR—In an old copy of *Knowledge News* I came across a feature on the artificial language, Safo. There is another new language – Esperanto.

Esperanto is called an extracted language because its main features are taken from living languages. This makes it very easy to learn; for example, an Englishman can recognise 70 or 75 per cent of the vocabulary.

The time taken to learn Esperanto is only a tenth of that taken to learn any other language, for two reasons. First, the vocabulary is made up by adding suffixes and prefixes to the words, so that an Esperanto dictionary is very small. Secondly, the grammar is very simple – it takes up only one page and has only 16 rules.

Esperanto is definitely a living language, as several million people speak it. It is designed to give everyone a second language in the shortest possible time with the least possible trouble.

A. Bray,
1 Brandling Terrace,
Leeds 10.

Lobster Lake

DEAR EDITOR—Recently my brother and I visited Pemba, the sister island of Zanzibar. While we were there, an uncle took us to see the Mwana Mashungi pool in Chake Chake, a small town. Many of the local people put out tit-bits and raw eggs for the Mwana Mashungi – a name meaning 'Child of Sophistication'. The creature is in fact an overgrown lobster. If anyone strikes the surface of the water three times, the lobster appears. The person then voices his wishes while feeding the lobster.

My brother and I tried this out. The lobster did appear but our wishes have not yet been granted.

Alamin Kassam,
P.O. Box 626,
Zanzibar.

Tall Story

DEAR EDITOR—In our local churchyard is buried John Middleton, often called the Child of Hale. He lived between 1578 and 1623, and by the time he died had grown to a height of 9 feet 3 inches.

The story goes that every night before he went to sleep he wished that he was a giant. One morning he woke up to find that his wish had been granted.

Eric Williams,
14 *Heathgate Avenue,*
Speke, Liverpool 24.

Fair Exchange

DEAR EDITOR—In *Knowledge* No. 33 there was an interesting article about Ferdinand Magellan. I would like to tell you of some other things he took on board before he left on his voyage round the world.

Apart from the provisions you mention, there were 200 red caps, 300 coloured handkerchiefs, 2,000 brass and copper rings, 20,000 small bells, and large quantities of knives, scissors, and mirrors. These were used to barter with the natives they encountered; one small mirror would fetch about two melons and three fowls.

One of the crew of the *Victoria*, Pigafetta, received three fowls and two urns of goat's milk in exchange for an old playing card he found in his pocket, and even then the natives felt they had not given him a fair price.

Alexander Fisher,
10 *Jedburgh Gardens,*
Glasgow N.W.

Examination Dates

DEAR EDITOR—Why is it that everybody wants to change the date of the General Certificate of Education examination, at present held in the summer? It would be no better to have it at the end of the winter term, particularly if we have another winter like last year's. How would a student manage to work at home, particularly if he had brothers and sisters? At least in summer the other members of the family can go outside to play, leaving the house quiet.

In any case, I think that if the student really wanted to succeed he would have the will power to put pleasure out of his mind until after the examination.

Mary Dibble (*age* 14),
Amana House,
High Street, Nelson,
Nr. Treharris, Glam.

Hit or Miss

A boy is throwing stones at his neighbour's greenhouse.

Angry Neighbour: 'I'll teach you to throw stones at my greenhouse.'

Boy: 'I wish you would – I've thrown ten already and I haven't hit it yet.'

R. A. King (*age* 11),
20 *Pathfields,*
Dartmouth, Devon.

Can you answer these?

1. What is the correct name for 'snapdragons' and what do we generally call *myosotis*?
2. What sort of gardener lays out grounds in an informal style to look as if they had grown naturally?
3. What is topiary?
4. What do we call the glass 'shelter' like an inverted V or bell that is put over a plant or row of plants?
5. What are (a) an annual; (b) a biennial; (c) a perennial?
6. What group of plants is covered by the general name of *brassica*?
7. Against what would you find an espalier tree trained?
8. What are corms?
9. What vegetables might be Jerusalem or Globe?
10. What are 'catch crops'?

ANSWERS

1. *Antirrhinums; forget-me-not.*
2. *Landscape (gardener).*
3. *The art of cutting shapes and designs in hedges and bushes.*
4. *A cloche.*
5. *(a) Flower blooming one season only; (b) flower blooming once only but taking two seasons to reach flowering stage; (c) plant that can be left undisturbed to flower year after year.*
6. *Greens.*
7. *Wall or lattice-work.*
8. *Thick underground stems or solid bulbs.*
9. *Artichokes.*
10. *Crops interplanted with other crops to save garden space.*

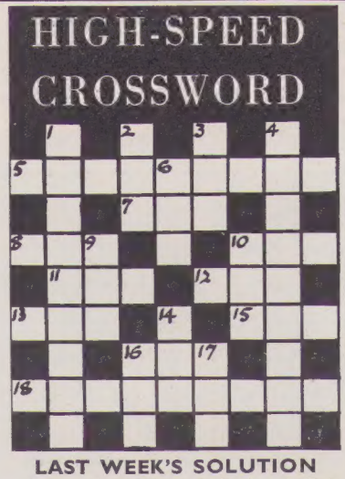
BRAIN ? BOX

1. 'What holds these stones together?' asked Father, laying his hand on the stone wall by which he was standing. 'That's easy,' replied Jimmy. 'The mortar, of course.' 'You might think so,' said Father, 'but I can prove that it isn't.' Can you?
2. In order to train a vine up my garden wall I need to put a wire from a point on the ground three feet away from the wall to a point on the wall four feet above the ground. What is the length of the wire? (You should be able to do this in your head.)
3. If the following numbers were held up to a mirror, which would still look the same: 99; 313; 619; 808?
4. Change the last letter of these words to make different words: POLICE; FLOWED; TREAT; PASTED. (Do not use R or S for the last word.)

ANSWERS

1. *Father's proof was that the stones keep the stones together, not the mortar; if you pulled some stones out of the wall, the others would fall down.*
2. *5 feet (by use of Pythagoras' theorem).*
3. *808.*
4. *Policy; flower; tread; pastel.*

HIGH-SPEED CROSSWORD



Clues Across

5. You are advised not to take coals here (9).
7. Lochinvar swam this river (3).
8. Possessive adjective (3).
10. Play on words (3).
11. Drake's bowling green (3).
12. Towing boat (3).
13. Noise (3).
15. Another possessive adjective (2nd person singular) (3).
16. People go to Brighton and Blackpool to see it (3).
18. Many a teenager's age (9).

Clues Down

1. Great German composer (9).
2. Frozen water (3).
3. Request (3).
4. Killing (9).
6. Snake – that killed Cleopatra? (3).
9. The farmer does it and has one (3).
10. Place (3).
14. Where Daniel found himself (3).
16. Arrange (3).
17. What you did at tea (of which it is an anagram) (3).

Solution next week.

LAST WEEK'S SOLUTION

ACROSS: 1, Mundane; 5, Passion; 7, Doh; 8, Net; 9, Arm; 10, Act; 12, Fly; 13, Holy Day; 14, Bending.

DOWN: 2, Utah; 3, Destroyed; 4, Neon; 5, Pouch; 6, Newly; 11, Tope; 12, Fain.

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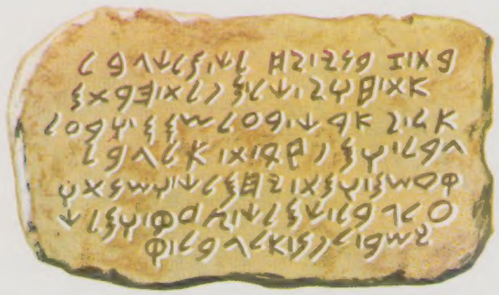
Greeks (*see fig.* 5). It was from the Greek alphabet that the Roman alphabet (*see fig.* 6) evolved. It is on the Roman alphabet that the one we use today is based.

An ancient Chinese verse meaning: 'Year in, year out, spring returns'

THE CHINESE is one of the most fascinating writing systems of all. Unlike other alphabets, it did not wholly progress to the phonetic stage (using symbols for sounds), but kept many symbols which represent facts or ideas. Chinese writing has changed little in 2,000 years, although spoken Chinese has. Dialects vary enormously throughout China, and a man from Peking might not understand the speech of a man from Canton, but if he were literate he would certainly understand his writing.



④ *Phoenician writing – it was the Phoenicians who brought phonetic writing to Europe*

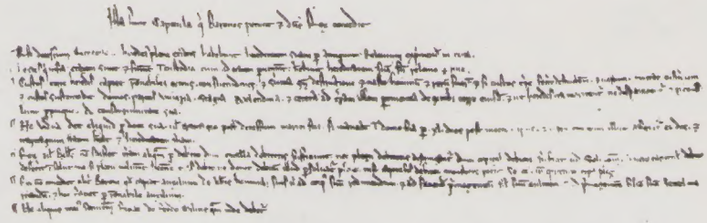
Αα Ββ Γγ Δδ Εε Ζζ Ηη Θθ

Ιι Κκ Λλ Μμ Νν Ξξ Οο Ππ

Ρρ Σ σς Ττ Υυ Φφ Χχ Ψψ Ωω

⑤ *The Greek alphabet from which ours is derived*

⑥ *A Roman inscription on the Pantheon in Rome*



⑦ *The Gothic script of Magna Carta*

I really must write better

⑧ *Modern Italic script – this sort of script was first used in the 15th century*

⑨ *Copperplate writing*

How our handwriting has changed

Most handwriting based on the Roman alphabet today is a mixture of two systems: *Gothic* (*see fig.* 7) and *Italian* (*see fig.* 8). Gothic was a heavy knotted hand which came into being at the end of the Dark Ages. The Italian hand was introduced at the beginning of the 15th century, and it is on this that the *Italic* writing, which is often taught in schools today, is based. The English branch of Gothic was known as *Secretary*, and in the 16th century this was modified by the introduction of Italic. In the 18th and 19th centuries writing became sloping and looped like copperplate handwriting. *Copperplate* got its name from the type of handwriting that was engraved on printers' copper plates (*see fig.* 9). At the beginning of this century Italic was introduced again, and has had a great influence on our writing. Many people write with it, and formation of letters by many of those who do not has been influenced by it.

At first numbers were recorded by simple strokes. The Greeks used the letters of their alphabet with an apostrophe to record numbers. The Romans used symbols and letters to represent various numerical quantities. Their numerals were in general use in Europe up to the end of the 10th century, when a much more effective system was introduced – Arabic numerals which are used today.

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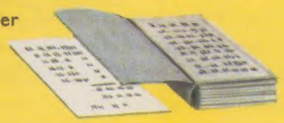
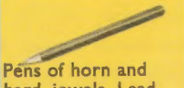
WRITING MATERIALS THROUGH THE AGES

PERIOD	PEOPLE	WRITING MATERIAL	IMPLEMENT
Stone Age	Primitive people	Stones	Sharp stones
From 4000 B C	Chinese, Egyptians, Sumerians, Hittites, Assyrians	Bone, wood, skins, and terra-cotta tablets	Sticks and brushes
From 2000 B C till 6th century B C	Egyptians, Greeks, Persians, Arabs	Papyrus scrolls	Pointed canes and ink
From 6th century B C	Greeks, Romans	Papyrus and tablets of wood coated with wax	Metal, bone, ivory, and cane
From 2nd century B C	Greeks, Romans	Scrolls of papyrus and leaves of parchment bound as books	Pointed canes and ink
From 2nd century A D till 19th century	Chinese (1st century A D), Arabs (9th century A D), Western Europe (12th century A D)	Paper	Goose quills and ink
From the Middle Ages	Civilised people	Paper 	 Pens of horn and hard jewels. Lead pencil (16th century)
From 19th century	Civilised people	Paper	Typewriters invented
From 19th century	Civilised people	Paper	Steel pens
From 19th century	Civilised people	Paper	Fountain pens
20th century	Americans and then all civilised people	Paper	Ball-point pens

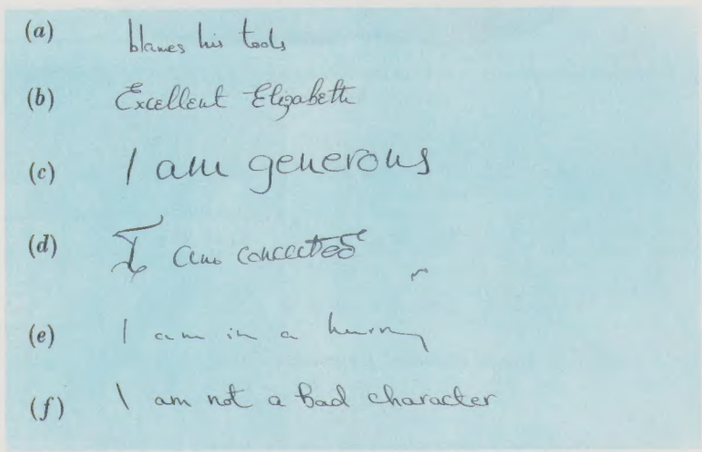
How handwriting can show character and profession

A graphologist claims that he can gain some idea of a person's character or profession through his or her handwriting. Here are some of the points a graphologist looks for.

Elongated writing (a) is often used by mechanically minded people and people who use tools. The use of the Greek 'e' (b) sometimes shows that the person is cultured. It is often 'inherited' from one's parents. Large writing (c) often means that a person is generous and somewhat extravagant and has a certain amount of enthusiasm and love of grandeur. Flowery or ornamental writing (d) can mean that the writer likes to show off and can be conceited and self-opinionated. Filliform (e) is slurred, hurried handwriting. It is often a mark of people who want to get somewhere before they have started. Regressive handwriting (f) does not mean a bad character – sometimes people find it comfortable to write in this way, especially left-handers.

Punctuation marks can also give a clue to the character of the writer. Light pressure on the pen when forming a full stop, or a comma sometimes just visible, shows the writer may be nervous, sensitive, and unassuming. The writer who puts full pressure on his pen may be stubborn, self-determined, and emphatic. 'i' dots are also significant. Dots in front of the 'i' may show an impulsive character, 'i's' without any dots a forceful character. Dots behind the 'i' can mean that a person puts things off. Dashes instead of dots can mean the person is bad-tempered, and dots directly over the 'i's' may mean a person is precise.

An 'o' is joined at the top by most people. An 'o' which is left open at the bottom has been thought to mean an untrustworthy character. The crossing of the 't' is carefully observed by graphologists. A cross high on the 't' stem can mean high ideals. A cross which goes right through the middle can mean reliability, and a cross which is mostly behind the 't' can mean lack of drive. However, you should not take all this too seriously, although graphology as a science has many followers.



Some more terms

Calligraphy is the art of beautiful writing.
Cursive is writing in which the letters are joined together.
Graphology is the study of handwriting.
Palaeography is the study of ancient handwriting.